Abstract

The objective of the proposed study was to compare seasonal aerosol samples collected during Spring, Summer, Fall and Winter from 3 US cities with high prevalence of asthma, Boston, Philadelphia and Detroit, to determine the effect of seasonal variation on bacterial urban aerosol composition. In addition comparisons were made between aerosol bacterial communities from these three cities and those present in San Francisco in the Spring. To determine if there were any similarities between aerosol and airway bacterial communities comparisons were also made between aerosol and respiratory samples from asthmatic patients (collected in a separate multi-center US trial). Finally, analysis of commonalities and distinctions in urban aerosols in East coast versus West coast samples were examined to determine whether geographic location impacted the bacterial community present at these sites. Bacterial community composition varied across sites but appeared, at least in the samples analyzed, to be more associated with specific geographic location than by seasonality. Phyla detected in these samples represented a vast diversity of bacteria and included many members of the Firmicutes and Bacteroidetes, two of the primary phyla colonizing the human gastrointestinal tract as well as members of the Sphingobacteria and Actinobacteria that have previously been detected in the respiratory tract of patients with inflammatory airway disease. A comparison of bacterial communities from Boston, Philadelphia and Detroit (collected in the Spring) to those detected in the same season in San Francisco revealed a core of bacteria common to all samples. Nonetheless, geographic-based differences in aerosol community composition were detected between San Franciscan and East Coast samples, suggesting that habitation at a specific site may result in distinct bacterial exposures and, potentially contribute to geographic-specific differences in airway disease prevalence. Comparative analysis of communities detected in urban aerosols and those found in the airways of asthmatics demonstrated a large overlap in these communities, supporting the notion that bacterial species present in environmental aerosols may serve as an inoculum for human respiratory mucosal surfaces in patients predisposed to colonization at these sites and contribute to airway disease prevalence at geographically distinct sites.